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AY Munj
Regional Fruit Research Station,
Vengurle, Dr. B. S. Konkan
Krishi Vidyapeeth, Dapoli,
Maharashtra, India

VK Zote
Regional Fruit Research Station,
Vengurle, Dr. B. S. Konkan
Krishi Vidyapeeth, Dapoli,
Maharashtra, India

RA Raut
Regional Fruit Research Station,
Vengurle, Dr. B. S. Konkan
Krishi Vidyapeeth, Dapoli,
Maharashtra, India

BR Salvi
Regional Fruit Research Station,
Vengurle, Dr. B. S. Konkan
Krishi Vidyapeeth, Dapoli,
Maharashtra, India

Correspondence
AY Munj
Regional Fruit Research Station,
Vengurle, Dr. B. S. Konkan
Krishi Vidyapeeth, Dapoli,
Maharashtra, India

Survey and surveillance of pollinators of mango in South Konkan coastal region of Maharashtra

AY Munj, VK Zote, RA Raut and BR Salvi

Abstract

The present study was conducted to record the major pollinators of mango in South Konkan coastal region of Maharashtra during the flowering season of 2011 and 2012. The results revealed that the stingless bee (*Tetragonula* sp.), blow fly (*Chrysomya* sp.), Indian honey bee (*Apis indica* Fab.), syrphid fly (*Syrphus* sp.), gaint honey bee (*Apis dorsata* Fab.), wasp (*Vespula orientalis* Lin.), house fly (*Musca* sp.), red ant (*Oecophylla smaragdina* Fab.), black ant (unidentified) and lady beetle (*Cheilomenes sexmaculata* Fab.) were the important pollinators of mango in Konkan region. The study on intensity of the major pollinators indicated that the intensity of stingless bee *Tetragonula* sp. was high (11.50/hour) followed by honey bee, *Apis indica* Fab. (6.40/panicle/hour) and blow fly, *Chrysomya* sp. (5.85/panicle/hour) during flowering period and the peak intensity of these pollinators was observed during 4th to 6th standard meteorological week.

Keywords: Mango, pollinators, *Tetragonula*, *Trigona*, *Chrysomya*, *Apis indica*

1. Introduction

Mango is an important fruit crop of Konkan region of Maharashtra and Alphonso is the leading cultivar of this region which is famous worldwide due to its excellent taste and flavour [1]. It plays an important role in the economy of this region. It occupies an area of 1,84,000 ha in Konkan region with the annual production of 3,25,000 MT [2]. In Konkan region the productivity of Alphonso mango is low i.e. less than 3.00 tons/ha [3]. One of the reasons behind the low productivity is incidence of insect pests and diseases and poor pollination [4].

The role of pollinators in pollination of mango is well known. Thirty nine species of pollinators have been recorded in mango in Southern Taiwan during February-March, 2005 [5], whereas, 28 insect species have been reported as pollinators in mango at Pantnagar [6]. Stingless bee, *Trigona (Tetragonula) iridipennis* Smith was recorded as a major pollinator in gardens and orchards [7].

Several hymenopterans species were found suitable for pollination of mango [8]. After release of population of the fly, *Chrysomya megacephala* Fab. in mango orchard, the fruit production was found to be increased [9]. It has been reported that the insects of Diptera and Hymenoptera play major role in pollination of mango [10, 11]. Also, the abundance of stingless bees has been reported in the Indian Subcontinent [12]. However, the information regarding the major pollinators of mango and their peak activity period in Konkan region of Maharashtra is lacking. Therefore, the present studies were conducted to record the major pollinators of mango in South Konkan coastal region of Maharashtra during flowering season of 2011-12.

2. Material and Methods

2.1 Survey of pollinators

Survey was carried out from ten villages of Sindhudurg district viz., Tulas, Vetore, Bhedshi, Ghotge, Kadawal, Jambhawde, Dhamapur, Amberi, Vaibhavwadi and Sangulwadi to record the pollinator species prevalent in mango orchards in Sindhudurg district of South Konkan coastal region during flowering season of 2010. One mango orchard was selected from each selected village and these orchards were visited once in a fortnight during peak flowering period i.e. January-February, 2010 and the panicles were observed carefully. The visiting insects were collected with the help of hand net and identified from the authentic source.

2.2 Intensity and peak period of pollinators

The detail study on the intensity and peak period of predominant species of pollinators was conducted at Regional Fruit Research Station, Vengurle, Dist. Sindhudurg during flowering

season of 2011 and 2012. A block of ten Alphonso mango trees of fifteen years age was selected for recording observations, which was kept free from insecticide sprays. In a week period, randomly ten panicles were examined carefully during morning hours. Each panicle was examined carefully for an hour in the morning and the visiting pollinators were counted [12]. These observations were recorded during the flowering period at weekly interval i.e. from 1st to 10th standard meteorological week.

2.3 Statistical analysis

The percent population of different pollinators was worked out on the basis of individual population data of different collected pollinators and total population of collected pollinators.

3. Results and Discussion

3.1 Survey of pollinators

The list of visiting insect pollinators recorded in Sindhudurg district of Konkan region during flowering period of 2010 is presented in Table 1. From the data it is revealed that during the survey the population of stingless bee (*Tetragonula* sp.), Indian honey bee (*Apis indica* Fab.) and blow fly (*Chrysomya* sp.) was high (26.30, 17.59 and 16.30%, respectively). Whereas, the population of syrphid fly (*Syrphus* sp.) and red ant (*Oecophylla smaragdina* Fab.) was moderate (9.81 and 9.63%, respectively) and the population of other pollinators viz., wasp (*Vespula orientalis* Lin.), giant honey bee (*Apis dorsata* Fab.), an unidentified black ant, house fly (*Musca* sp.) and lady beetle (*Cheilomenes sexmaculata* Fab.) was low (4.81, 4.81, 4.44, 4.07 and 2.22%, respectively). These results indicate that stingless bee (*Tetragonula* sp.), Indian honey bee (*Apis indica* Fab.) and blow fly (*Chrysomya* sp.) are the major pollinators of mango in Konkan region of Maharashtra.

Table 1: List of visiting pollinators recorded at different Alphonso mango orchards of Sindhudurg district during flowering season of 2010

Sr. No.	Common Name	Scientific Name	Order	Family	Total Count	Per cent Population	Intensity
1	Stingless bee	<i>Tetragonula</i> sp.	Hymenoptera	Apidae	284	26.30	High
2	Honey bee	<i>Apis indica</i> Fab.	Hymenoptera	Apidae	190	17.59	High
3	Blow fly	<i>Chrysomya</i> sp.	Diptera	Calliphoridae	176	16.30	High
4	Syrphid fly	<i>Syrphus</i> sp.	Diptera	Syrphidae	106	9.81	Moderate
5	Red ant	<i>Oecophylla Smaragdina</i> Fab.	Hymenoptera	Formicidae	104	9.63	Moderate
6	Wasp	<i>Vespula orientalis</i> Lin.	Hymenoptera	Vespidae	52	4.81	Low
7	Giant honey bee	<i>Apis dorsata</i> Fab.	Hymenoptera	Apidae	52	4.81	Low
8	Black ant	Unidentified	Hymenoptera	-	48	4.44	Low
9	House fly	<i>Musca</i> sp.	Diptera	Muscidae	44	4.07	Low
10	Lady beetle	<i>Cheilomenes sexmaculata</i> Fab.	Coleoptera	Coccinellidae	24	2.22	Low
Total					1080	100	

Note: High = >10% population

Medium = 5 to 10 % population

Low = < 5% population

3.2 Intensity and peak period of pollinators

The data on the population of different major pollinators recorded in Alphonso mango orchard at Regional Fruit Research Station, Vengurle during flowering season of 2011, 2012 and the pooled data of two years is presented in Table 2. From the data it is revealed that during 2011, the population of *Tetragonula* sp. reached to the peak (14.20/panicle/hour) during 6th SMW. Similarly, the population of *A. indica* reached to the peak (6.90/panicle/hour) in the 6th SMW, whereas, the peak population of *Chrysomya* sp. (5.90/panicle/hour) was recorded in the 4th SMW. The total population of major pollinators during flowering period of 2011 ranged between 12.90 to 26.20/panicle/hour. The peak population of major pollinators (26.20/panicle/hour) was recorded during 6th SMW.

During flowering period of 2012, the peak population of *Tetragonula* sp. (8.80/panicle/hour) was recorded during 6th SMW followed by *A. indica* (5.90/panicle/hour) during 5th SMW followed by *Chrysomya* sp. (5.80/panicle/hour) during 4th SMW. The total population of major pollinators during flowering period of 2012 ranged between 14.00 to 18.40/panicle/hour with the peak population of 18.40/panicle/hour during 4th SMW.

From the pooled data of two years it was revealed that the population of the major pollinator *Tetragonula* sp. reached to the peak (11.50/panicle/hour) during 6th SMW and the population of *A. indica* reached to the peak (6.40/panicle/hour) during 5th SMW. Whereas, the maximum population of *Chrysomya* sp. (5.85/panicle/hour) was recorded during 4th SMW. The total population of major pollinators ranged between 14.05 to 22.20/panicle/hour with the peak population of 22.20/panicle/hour during 5th SMW.

The present findings are in comparison with some earlier workers. Twenty different pollinators were reported in mango at GBPUAT, Pantnagar [6]; whereas, 39 species of pollinators were recorded in mango in Taiwan [5]. Vijay Kumar and co-workers [7] and Nayak and co-workers [12] reported stingless bee as a major pollinator in gardens and orchards of Indian subcontinent. Dag and Gazit [11] and Singh [10] reported that the insects of Diptera and Hymenoptera play major role in pollination of mango. Dag and Gazit [11] reported the population of 12.9 insect pollinators/panicle/hour in mango at Taiwan. Hung [9] reported that after release of population of the fly, *Chrysomya megacephala* Fab in mango orchard, the fruit production was increased. Jyothi [8] reported that several hymenopteran species are suitable for pollination of mango.

Table 2: Population of different major pollinators in Alphonso mango orchard during flowering season of 2011, 2012 and pooled mean

Sr. No.	SMW No.	Population of different pollinators/panicle/hour during morning time											
		2011				2012				Mean			
		<i>Tetragonula</i> sp.	<i>Chrysomya</i> sp.	<i>A. indica</i>	Total	<i>Tetragonula</i> sp.	<i>Chrysomya</i> sp.	<i>A. indica</i>	Total	<i>Tetragonula</i> sp.	<i>Chrysomya</i> sp.	<i>A. indica</i>	Total
1	1	6.40	4.40	2.80	13.60	6.40	6.00	3.00	15.40	6.40	5.20	2.90	14.50
2	2	5.90	3.10	3.90	12.90	6.60	4.80	3.80	15.20	6.25	3.95	3.85	14.05
3	3	7.70	4.60	4.70	17.00	5.20	5.40	4.20	14.80	5.45	5.00	4.45	14.90
4	4	10.30	5.90	6.10	22.30	6.80	5.80	5.80	18.40	8.55	5.85	5.95	20.35
5	5	13.90	5.30	6.30	25.50	8.60	3.80	5.90	18.10	11.25	4.55	6.40	22.20
6	6	14.20	5.10	6.90	26.20	8.80	3.60	4.60	17.00	11.50	4.35	5.75	21.60
7	7	10.10	3.90	4.80	18.80	8.60	2.60	3.60	14.80	9.35	3.25	4.20	16.80
8	8	8.10	2.70	5.30	16.10	7.80	4.80	4.20	16.80	7.95	3.75	4.75	16.45
9	9	8.20	3.60	4.90	16.70	7.80	3.60	4.20	15.60	8.00	3.60	5.55	17.15
10	10	7.70	3.00	3.90	14.60	7.20	3.00	3.80	14.00	7.45	3.00	3.85	14.30
Peak population		14.20	5.90	6.90	26.20	8.80	5.80	5.90	18.40	11.50	5.85	6.40	22.20
Peak period		6 th SMW	4 th SMW	6 th SMW	6 th SMW	6 th SMW	4 th SMW	5 th SMW	4 th SMW	6 th SMW	4 th SMW	5 th SMW	5 th SMW

4. Conclusion

From the overall results it can be concluded that among the three major pollinators of mango, the *Tetragonula* sp. was predominant followed by *A. indica* and *Chrysomya* sp. in Konkan region of Maharashtra. The peak population of these three pollinators was recorded during 4th to 6th SMW. Therefore, it is suggested to avoid the insecticide sprays during 4th to 6th SMW in mango orchards of Sindhudurg district to get maximum fruit setting in order to increase the yield. Also, efforts should be taken to rear these species of pollinators in mango orchard.

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